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FIRE WEATHER SEVERITY FOR SOUTHERN CALIFORNIA IN 1961

By
C. M. Countryman and Arthur R. Pirsko

In 1959 California experienced one of its most disastrous fire years of recent history. Deficient spring precipitation, a hot, dry summer, and unusually frequent föehn type winds with their extremely low humidities and high speeds combined to make the season a nightmare for the firefighting forces. When the first winter rains fell, firefighters relaxed and looked forward to an easier season in 1960. California had never experienced two bad seasons statewide in succession; there was no reason to expect any change now.

But the 1960 season was not easier. The same pattern of weather that occurred in 1959 began to appear early in the spring, and by the end of the 1960 season California had gone through a season with even worse burning conditions than 1959.

Then, for the third season in a row, the familiar weather pattern began to develop in the spring of 1961. Fire control agencies quickly realized that the potential for fire losses in 1961 could easily surpass anything before experienced. They began hurriedly to bolster their firefighting capacity and to warn the public of the potential danger. The danger materialized, and this is a report of the conditions that firefighters had to contend with in 1961.

Fire Weather Severity

New indexes in the California fire danger rating system provide a convenient means of getting a quantitative measure of the fire weather for any time period desired. The rating system now includes five basic indexes:

Spread Index--a measure of how fast a fire will spread.
Intensity Index--a measure of how hot a fire will burn.
The Ignition Index--a measure of the ignition potential of a firebrand and also the spotting potential of a fire.
Burning Index--a combination of intensity and spread indexes which gives a measure of the potential control job of an individual fire.
Fire Load Index--a combination of ignition and burning indexes which gives a measure of the total potential control job that the fire control organization may face.

The fire weather severity can be measured simply by cumulating the fire load index for the desired period.

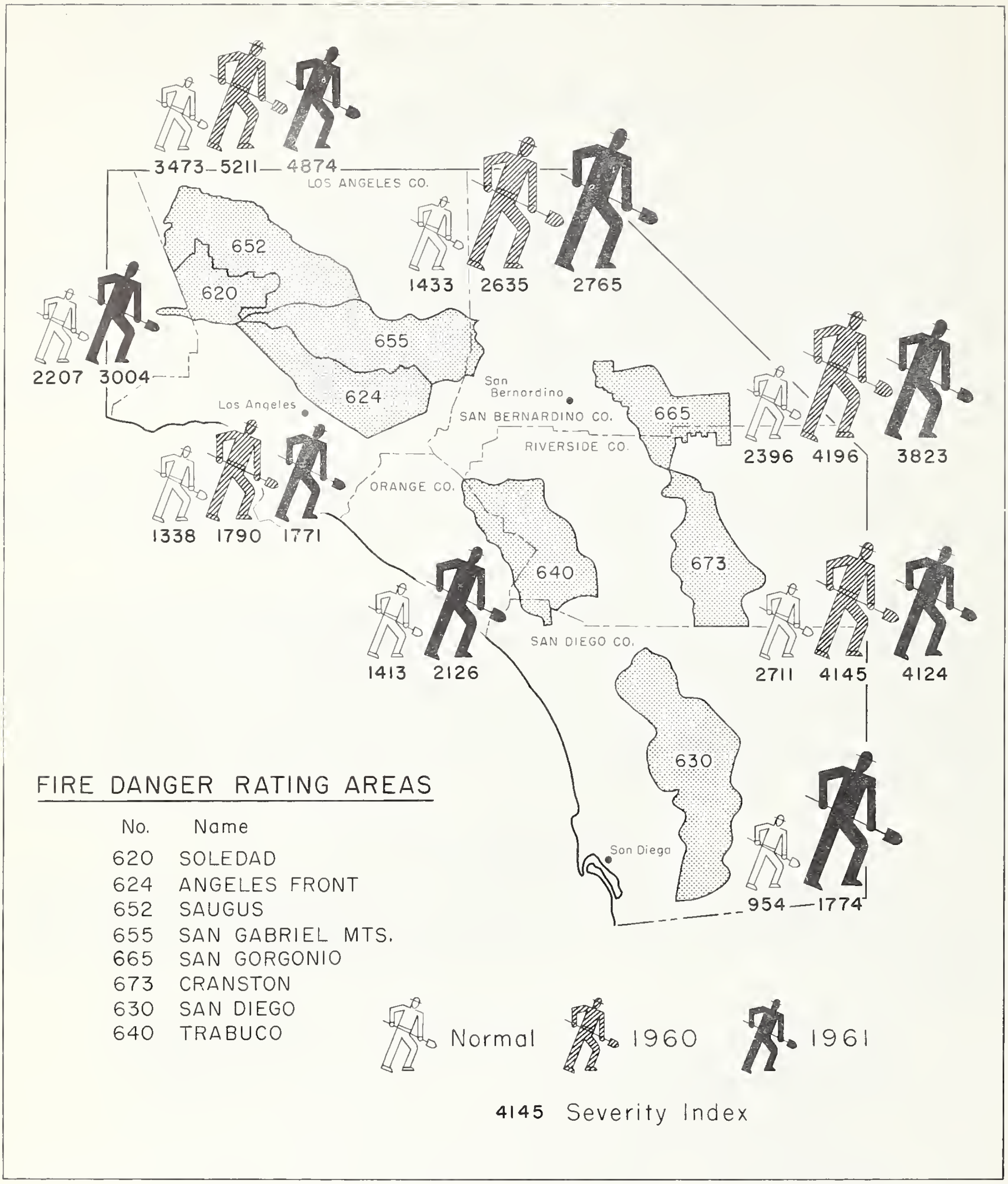

Figure 1.--Southern California fire weather severity, June 1 - October 31.

Representative fire danger rating areas were selected over southern California, and the fire load index was cumulated for these areas for the period of June 1 to October 31. In most areas the 1960 and 1961 seasons were of about equal severity for the entire period (fig. 1). Some areas were a little worse in 1961 than in 1960, some a little better. In each area, though, the seasonal severity far exceeded normal both years. The severe conditions were reflected in the severe fire behavior both years.

To show trends in the severity of the fire weather during the fire season, the severity index was computed by five-day periods for one sample area, and the departure of the index from normal for each period was determined. Five of the thirty 5-day periods had averages of normal or below (fig. 2). The others varied from slightly more than normal to much above normal. For example, from June 15 to 20, the index averaged 26; this is 23 points above the 3-point normal index for that period, or almost 9 times normal. Severe periods were experienced in June, early July, part of September, and October. The fire weather during the first 5 days in October, when the index averaged 30.2 points above the normal index of 10 for that period was particularly severe.

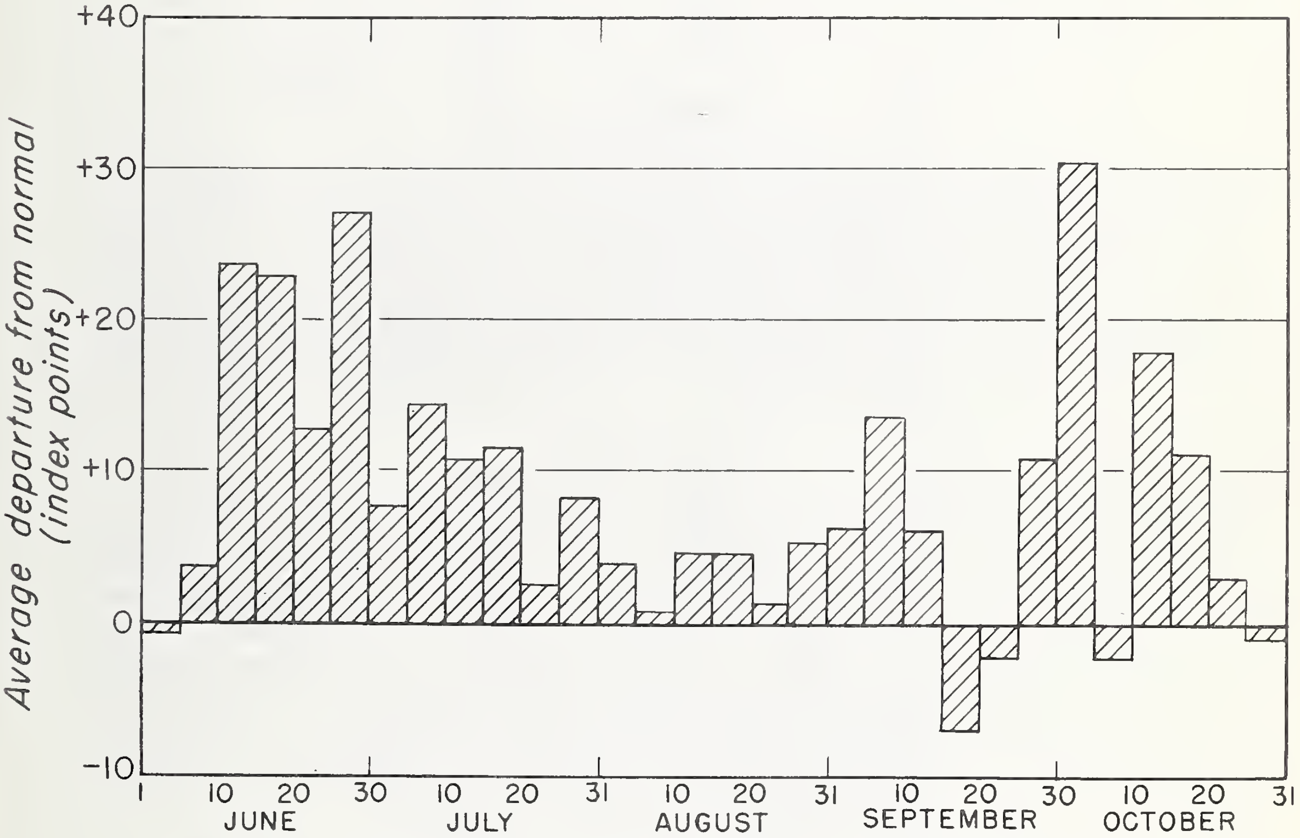

Figure 2.--Departure from normal of fire weather severity for Area 655, San Gabriel Mountains, in 1961.

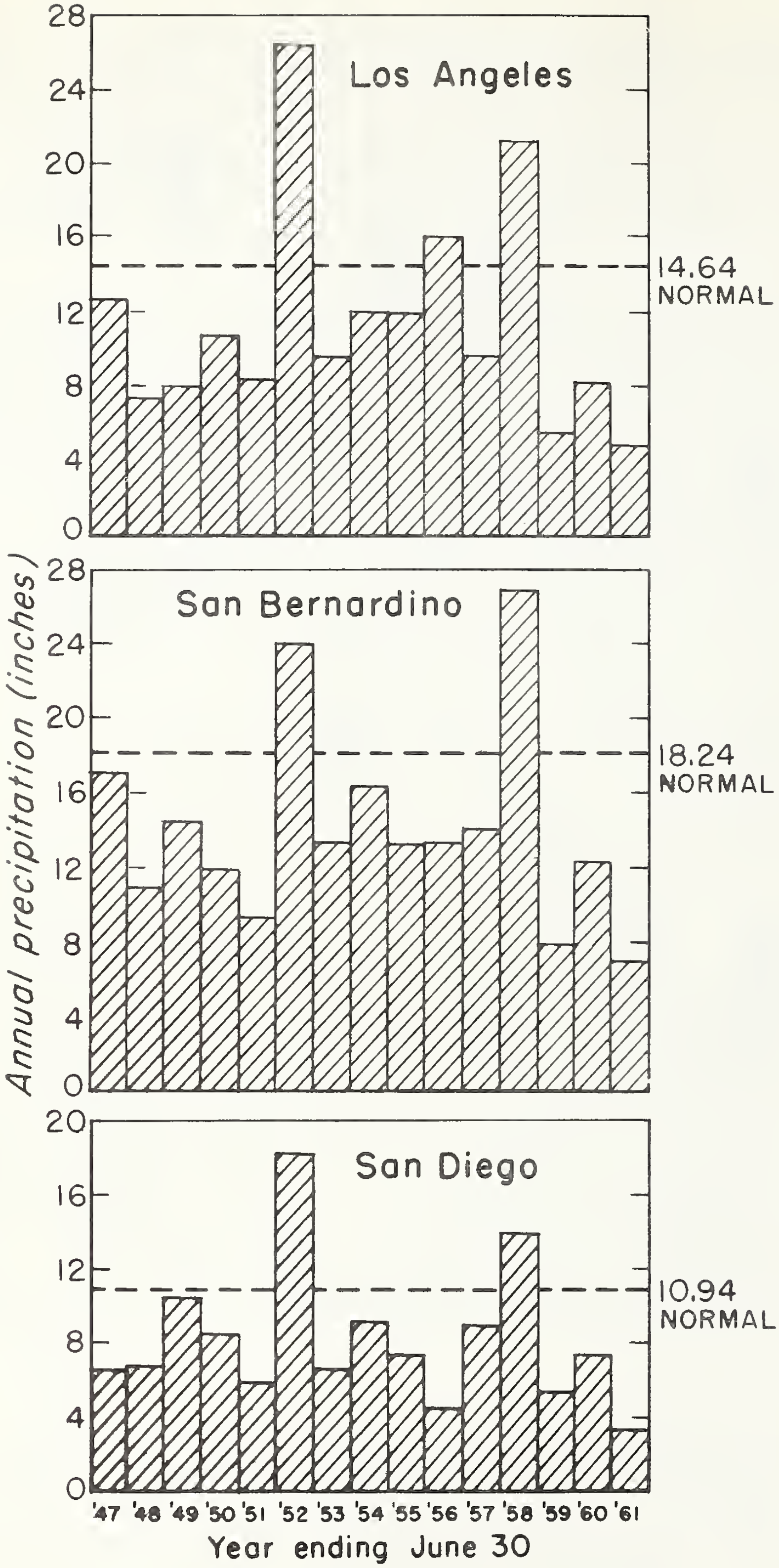

Figure 3.--Precipitation record for southern California for the last 15 years.

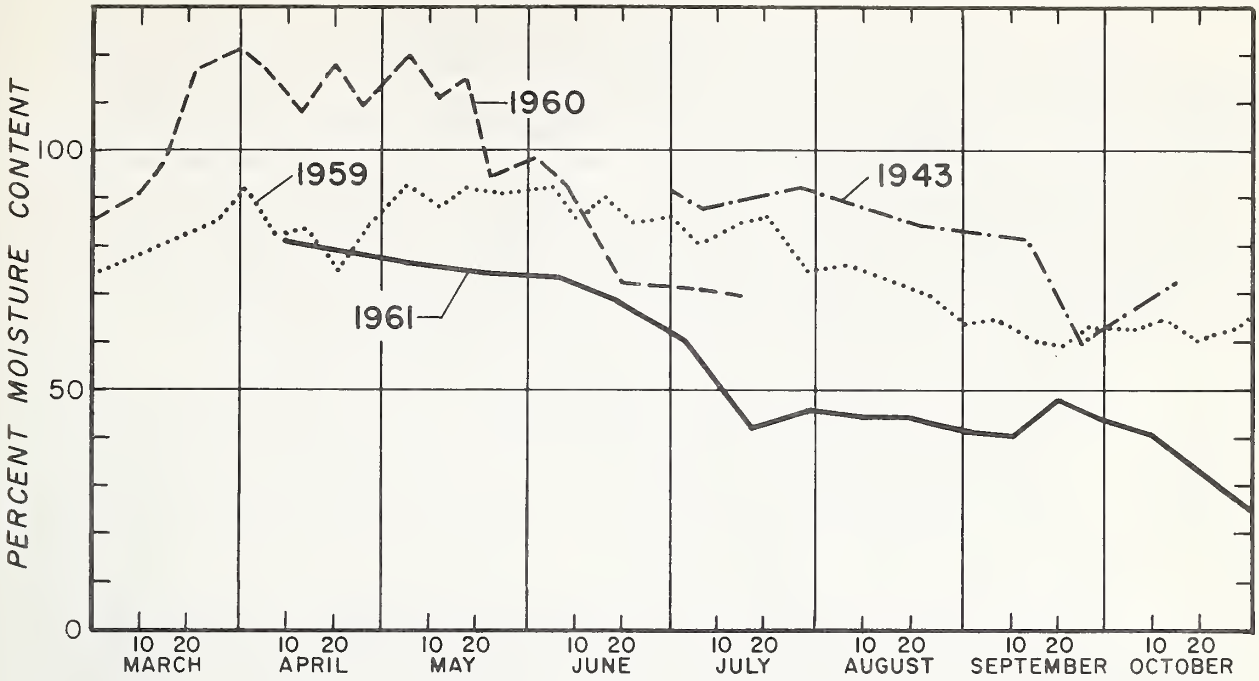

Figure 4.--Moisture in chamise foliage, Angeles National Forest.

Precipitation

Only twice in the past 15 years has the semi-arid southland had at least normal precipitation. The latest was in the 1957-58 rainy season (fig. 3). Since then three extremely low precipitation years have been recorded. In most fire danger rating areas the 12-month period ending June 30, 1961, was the driest of the past 15 years. Under such conditions even the heaviest of dead materials dry out and add to the difficulty of fire suppression.

Fuel Moisture

The three-year drought has had a profound effect on the moisture content of living fuels in southern California. The moisture content of chamise foliage on south-facing slopes and of scrub oak on north slopes was sampled at 10-day intervals since early April 1961, and some data on chamise moisture are available from other years (fig. 4). In 1961, the moisture content of chamise was well below that in the two preceeding dry years and far below the more normal year of 1943. By early July 1961, the moisture content of green chamise foliage was about the same as that reached in mid-September in 1959; by the end of October, it had reached an unprecedented low of 26 percent.

The moisture content of the oak on north slopes followed a similar trend. It reached a minimum of 35 percent by the end of October.

Low moisture content of living fuels can affect fire behavior significantly in chaparral fuels. In the normal year, these fuels quickly reach moisture contents of 160 to 200 percent of their dry weight when plant growth starts in early spring. In this condition the chaparral burns slowly and fires are relatively easy to control. As the new growth matures and available soil moisture is depleted during the rainless summer, fuel moisture gradually decreases. Fires burn more intensely and become increasingly difficult to control. Usually the moisture content of these fuels reaches a minimum sometime in September and becomes dangerously low for only a few weeks near the end of the fire season.

In 1961 a lack of soil moisture resulted in little new plant growth in the spring; many areas reported none at all. As a result, the normal surge of high fuel moisture was greatly reduced. Fuels dried early and rapidly. The period of low fuel moisture content extended for months instead of weeks. Fire-control forces were faced with hot-burning, difficult-to-suppress fires early in the season.

The low moisture content of the scrub oak was particularly significant in fire control. Usually chaparral species on north slopes do not dry out nearly as much as south slope species during the summer. Scrub oak, for example, normally reaches a minimum moisture content of 100 to 125 percent in the fall. Fires starting or burning into north slopes do not have the high intensity of south-slope fires. Fire-control strategy is frequently aimed at taking advantage of this difference in burning conditions between north and south slopes. In 1961, however, the north-slope oak fuel was nearly as dry as the south-slope chamise. Firefighters could no longer steer fires to north slopes and expect easier control--north slopes burned as hot as south slopes.

Three years of insufficient moisture has also taken its toll of living plants. The amount of dead and dying chaparral showed a marked increase in 1961. Sometimes parts of the plant have died; sometimes whole plants or groups of plants. The full extent of the tissue dieback will not be known until spring when new growth emerges. It is certain, however, that for southern California as a whole the amount of dead, and potentially highly flammable, fuels in the chaparral has been greatly increased. This increase in dead fuels can be expected to result in more-intense, difficult-to-suppress fires long after the living fuel moisture returns to its normal pattern.

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1961. Fire weather severity for southern California in 1961. U.S. Forest Serv. Pacific Southwest Forest and Range Expt. Sta. Misc. Paper 65. 6 pp., illus.

Long drought, severe daily fire weather, and extraordinarily dry fuels combined in 1961 to present southern California fire-control agencies with the worst fire-control job in recent history. The cumulative effects of the drought on the fuel charactistics of the southern California chaparral may increase difficulty of fire control for years to come.

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